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Effect of benzyladenine on post-harvest berry drop in Anab-e-Shahi grapes (*Vitis vinifera* L.)

by

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Cytokinins are one of the six general classes of growth regulators, in addition to auxins, gibberellins, inhibitors, abscisic acid, and ethylene that regulate physiological functions of the plant. They are known to influence protein synthesis and/or degradation. They have been observed to act as mobilizing agents or produce 'sinks' for other endogenous compounds which regulate the physiological functions. Among their other properties, their ability to inhibit or retard senescence (8) is interesting. Senescence and deterioration of certain vegetables have been greatly reduced by their application, especially with N 6-benzyladenine (4, 1, 5). In these cases, either the green colour or freshness was retained for a longer period. In the case of cauliflower, addition of 2,4-D to the cytokinin spray resulted not only in the retention of the green colour but even the leaf abscission was prevented during storage (2). WEAVER and his co-workers have worked with cytokinins on grapes and their influences on set and development of berries have been reported (11, 12). Some results of the studies made by the author on the influence of a cytokinin application on post-harvest behaviour of grapes are reported in this paper.

Materials and Methods

The studies were carried out in March 1969 at the Agricultural College, Dharwar, on Anab-e-Shahi grapes. Bunches of uniform size and maturity were selected at random in the College vineyard and tagged. These bunches were sprayed thoroughly with two cytokinin formulations by a baby sprayer on March, 3. The sample of cytokinin, benzyladenine (BA)¹⁾ used in the experiment was in form of white crystalline powder. The formulation was prepared by slowly dissolving 250 mg of the chemical in 125 ml of ethanol and making the volume to 500 ml by distilled water so as to give a concentration of 500 ppm. The second formulation was prepared by dissolving the calculated quantity of the auxin, alpha-naphthaleneacetic acid (NAA) in the residual solution of the first formulation and the volume is made to have a concentration of 100 ppm each of cytokinin and auxin in the mixture. Both the formulations contained 0.1% Tween-20 as wetting agent.

The treated and untreated bunches were harvested a week after treatment (March, 10) at maturity [14—15% total soluble solids (T.S.S.)]. After cleaning and trimming the decayed and loosely-held berries, 9—11 bunches, weighing between 4.6 and 4.8 kg were placed in the experimental wooden crates (38 cm × 25 cm × 15 cm having aeration slits) in double layers in triplicates under each treatment. However, on account of insufficiency of the treated material, only duplicate crates were used in the case of cytokinin — auxin treatment. These fruit crates were kept in a ventilated room for further studies at room temperature (26—29° C). Every day the intact bunches, dropped and decayed berries in each crates were separated, counted and weighed and these observations were taken for a period of six days. At the close

¹⁾ The gift sample was kindly supplied by Dr. R. J. WEAVER, University of California, Davis, U.S.A.

Results and Discussion

Table 1

Treatment	Cumulative percent post harvest berry drop (w/w)					After 'drop test')	
	Days after harvest					Berry drop	Effect of growth regulators ²⁾
	1	2	3	4	5		
Control	0.5	0.7	1.6	6.0	19.1	47.9	100.00
BA 500 ppm	0.5	0.6	1.1	2.2*	5.7**	27.9*	41.75
Mixture containing 100 ppm each of BA and <i>α</i> -NAA	0.0	0.1	0.2	0.4+	0.7+	15.3+**	68.05

+ Significant at 5% level between treatments.

Treatment	Cumulative percent wastage after harvest (w/w)														
	1 day			2 days			3 days			4 days			5 days		
	LW	Decay	Total	LW	Decay	Total	LW	Decay	Total	LW	Decay	Total	LW	Decay	Total
Control	2.4	0.7	3.6	4.1	1.2	6.0	5.8	2.1	9.5	7.3	2.6	15.9	8.2	4.0	31.3
BA 500 ppm	3.5	0.5	4.5	5.3	1.3	7.2	6.8	2.5	10.4	8.4	3.5	14.1	10.2	3.8	19.7
Mixture containing 100 ppm each of BA and α -NAA	2.4	0.3	2.7	4.6	0.5	5.2	6.4	0.6	7.2	8.8	1.1	10.3	10.7	2.0	13.4

development of purple anthocyanin pigment in the rachis (10). There is no indication in these reports whether the thickened pedicels improved the berry adherence.

The mean data on cumulative percentage berry drop are presented in Table 1. For the first three days after harvest, there was no difference in berry drop in different lots. Significant difference was observed after four days in treated and untreated lots as well as within the two treatments. After five days, there was greater upsurge in the magnitude of drop in untreated lots (19.1%), followed by cytokinin treated (5.7%) and cytokinin-auxin treated lots (0.7%). The results of the 'drop test' confirms that the berries in the treated lots were more firmly held than in untreated ones. A closer observation of the detached berries in the treated lots after drop test revealed some interesting features. Berries with intact capstems (pedicel) were found in greater numbers in treated lots than in untreated. When the capstem was pulled from the berry, a greater force was required, especially in the lots treated with cytokinin-auxin mixture. While these observations may provide a strong inference of abscission control, anatomical and physiological investigations are required to confirm it.

Transformation of the untreated portion of partly treated Black Corinth clusters into either dead or stunted form was attributed to the mobilizing actions of the cytokinin treatment (12). Consistent with the mobilizing action of the chemical, the cytokinin treatment is reported to have induced senescence in the untreated leaves of the bean plant (3). Whether the cytokinin 'mobilized' the natural compounds from adjacent parts of leaves and shoots or retarded the degeneration of endogenous auxins of the bunch postponing the abscission in the present case, is not clear. Addition of NAA to cytokinin spray leading to additional strength in pedicel attachments reveals the marked effect of NAA in grape berry abscission, consistent with the earlier reports (6, 7).

The data on cumulative percent wastage due to physiological losses in weight, decay etc., are presented in Table 2. No significant difference was observed in losses in weight or decay. Berry drop alone contributed greatly to the total wastage. Its influence on grape senescence is therefore not clear. Trials with different concentrations are necessary to study this aspect. There is also need to try different combinations with NAA and other auxins.

Summary

Experiments conducted at the Agricultural College, Dharwar, showed that a preharvest spray of benzyladenine (a cytokinin) at 500 ppm significantly reduced the post-harvest berry drop in Anab-e-Shahi grapes. A mixture of 100 ppm α -NAA and 100 ppm cytokinin solution resulted in the least berry drop. The 'drop test' confirmed that the berries were more firmly held in the treated lots than in untreated ones. No marked influence of the chemical on the losses in weight and wastage was observed at this concentration.

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Literature Cited

1. HALEVY, A. H. and WITTWER, S. H., 1965: Chemical regulation of leaf senescence. Mich. Agr. Exp. Sta. Quart. Bull. 48, 30 [Zit.: Proc. Amer. Soc. Hort. Sci. 88, 582-590 (1966)].

2. KAUFMAN, J. and RINGEL, S. M., 1961: Tests of growth regulators to retard yellowing and abscission of cauliflower. *Proc. Amer. Soc. Hort. Sci.* 78, 349.
3. LEOPOLD, A. C. and KAWASE, M., 1964: Benzyladenine effects on bean leaf growth and senescence. *Amer. J. Bot.* 51, 294—298.
4. LIPTON, W. J. and CEPONIS, M. J., 1962: Retardation of senescence and stimulation of oxygen consumption in head lettuce treated with N⁶-benzyladenine. *Proc. Amer. Soc. Hort. Sci.* 81, 379.
5. MACLEAN, D. C., DEDOLPH, R. R. and WITTWER, S. H., 1963: Respiratory responses of braccoli (*Brassica oleracea* var. *italica*) to pre and post-harvest treatment with N⁶-benzyladenine. *Proc. Amer. Soc. Hort. Sci.* 83, 484.
6. MADALGATTI RAO, M., 1968: Further studies on reducing post-harvest berry drop in Anab-E-Shahi grapes. Mysore. *J. Agricult. Sci. (Communicated)*.
7. — —, NARASIMHAM, P., NAGARAJA, N. and ANANDASWAMY, B., 1968: Effect of pre-harvest spray of alpha-naphthaleneacetic acid and parachlorophenoxyacetic acid on control of berry drop in Anab-e-shahi grapes. *J. Food Sci. and Technol.* 5 (3), 127.
8. RICHMOND, A. E. and LANG, A., 1957: Effect of kinetin on protein content and survival of detached *Xanthium* leaves. *Science* 125, 650—651.
9. WEAVER, R. J., 1956: Plant regulators in grape production. *Calif. Agricult. Exp. Sta. Bull.* 752.
10. — —, McCUNE, S. B. and HALE, C. R., 1962: Effect of plant regulators on set and berry development in certain seedless and seeded varieties of *Vitis vinifera* L. *Vitis* 3, 84—96.
11. — — and VAN OVERBEEK, J., 1963: Kinins stimulate grape growth. *Calif. Agricult.* 17 (9), 12.
12. — —, — — and POOL, R. M., 1966: Effect of kinins on fruit set and development in *Vitis vinifera*. *Hilgardia (Davis)*, 37 (7), 181—201.

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